is there that the small pelagic animals upon which they feed swarm, as also do the Medusæ. Then comes to pass this very strange fact, which, however, is none the less proved, namely, that the fish, entering into certain natural anfractuosities of the Medusa, lodges there, issues thence, returns there at pleasure, and thus becomes its commensal. This is the only way, I believe, to explain this kind of association between two animals of such different types. It is to be remarked that, in order to penetrate into the Medusa without lacerating its tissues, the fish is compelled to swim on one side, that is to say in a perfectly abnormal position.

I take advantage of this opportunity to make known a new case of parasitism. I refer to the discovery of two examples of *Dorychthys excisus* (Kaup), male and female, found living in a Holothuria. These two fishes were sent to me from the Mauritius in October 1881 by M. de Robillard, with the assurance that they were quite alive when he took them out of the Holothuria. Unfortunately he could not tell me the species to which the Echinoderm belonged. Under any circumstances the fact seemed to me the more interesting and the more deserving of being noted, as it is, I believe, the only case of parasitism hitherto observed in the case of a fish of the order Lophobranchii.

The following are some characters of this *Dorychthys* which may serve to identify the species or to determine the age :— Total length 50 millim. Plates 18+15—16.

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## BIBLIOGRAPHICAL NOTICES.

*Minute Structure of the Central Nervous System of certain Reptiles and Batrachians of America.* Illustrated by permanent photo-micrographs by John J. Mason, M.D. Series A. Author's Edition. One hundred. Newport, 1879–1882.

The methods of histology have reached a perfection which is building up new departments of knowledge ; and among successful pioneers in these labours Dr. Mason will always hold an honoured place for the technical skill with which he brings the reader face to face with the revelations of his microscope, and for the sumptuousness with which his work is given to the world. No such monograph has previously come under our notice, for the illustrations of a difficult research leave nothing to be desired. Some nineteen reptiles and batrachians have been studied ; and the author has turned his attention to the structure of the spinal cord, the medulla

oblongata, cerebellum, optic lobes, and cerebral and olfactory lobes of the brain, making important discoveries in every direction. The subject is treated in a comparative manner, so that each region is studied through a number of animals and under different powers of the microscope, the results being represented in 113 quarto plates, which have been selected, as the author states, from over 5000 preparations, and form a comparative anatomy of the nervous system. The text, exclusive of the literature and explanation of the plates, only extends to twenty-four pages; but this brevity is due to the setting down of nothing but results. The author first describes his method of hardening, and details some examples of the variation in hardening and staining which the species exhibit. The tailed Batrachians stain easily, but require a third more time to harden than specimens of other orders. The sections were stained after being cut, transparency produced by oil of cloves, and the slices were mounted under thin glass in Canada balsam dissolved in chloroform. These sections are photographed on glass and developed with sulphate of iron, the glass having previously been coated with a solution of wax and benzole. The collodion-film is made adherent to a thin sheet of gelatine and removed from the plate, when it becomes available for the artotype process of printing, by which the beautiful results here presented were obtained.

The spinal cord is exemplified in no fewer than forty-four plates, and elucidated in seven pages of text. As among higher animals, this organ consists of white and grey matter, and the white matter shows the usual division into six columns; but the cord is characterized by an absence of the superior or posterior fissure, so that the union of the posterior columns is closer than in man. Two longitudinal bundles of white nerve-fibres extend along the spinal cord in Saurians, between the inferior white and grey commissures, extending forward from the lumbar region to form the central longitudinal bundle of the medulla oblongata on each side. These columns are especially conspicuous in the alligator, iguana, heloderma, skink, and anolis. The author finds that reptiles which are shielded by bony plates or by thick scales have the fibres of the superior columns of the spinal cord relatively smaller than in naked reptiles. The infero-lateral columns of the spinal cord are larger in the cervical than in the lumbar region. Some of the plates show well the "lateral ligament" of Dr. Mason. Other plates show the nerve-cells and the root-filaments of the nerves, together with their modes of exit. The contour of the grey substance in section is not unlike its contour in man, though in Ophidians the superior horns blend, and among Batrachians a reticular substance becomes interposed between the two halves of the grey matter. This substantia reticularis is equally large in the brachial and crural regions, and in the latter surrounds the central canal. This canal is lined with conical ciliated epithelium, and the processes given out from the cells in the frog's spinal cord are shown to be continuous with the network of the substantia reticularis. This substance is admirably exhibited in the plates, and, according to the author, affords "probably the best

example of what is almost universally regarded as connective tissue." Concerning the relative development of white and grey matter, it is seen that there is more white matter in the brachial region and more grey matter in the crural region of the frog. And since the length of the lumbar enlargement is to the cervical enlargement as 10 to 6 in the frog, it is evident that the grey matter is much more abundant in the lumbar region. Long-tailed Saurians like iguana and the alligator have the white and grey substances nearly equal at both enlargements; but those with short tails have the cervical enlargement more developed. Chelonians usually have no large nerve-cells in the inferior horns of the grey matter. In the gopher, multipolar and bipolar cells occur, which are similar to those seen in enlargements of the spinal cord in reptiles. Nerve-cells with nuclei, though abundant, only form a distinctly defined group in the dorsal region of the frog, above the level of the central canal, on each side of the substantia reticularis. In the frog the axis-cylinders of the inferior nerve-roots can be followed into the grey matter, and become lost in the large cells. These are the more important conclusions which the author formulates; but the materials which are represented in the plates make it manifest that a reticence and modesty have been shown, which throw a good deal of labour upon the reader in efforts to generalize where the author would probably have been more successful.

The spinal cord passes very gradually into the medulla oblongata, where the central canal and inferior commissure in Saurians occupy a lower plane, though in the alligator it rises and opens into the ventricle. Here the raphe appears, and extends as far forward as the substance which corresponds to the pons Varolii. In the meshes of the raphe are nerve-cells which extend forward, till just behind the plane of the auditory nerves they become the largest cells of the nervous system. Similar cells occur in skinks, anolis, heloderma, iguana, and all Saurians which have the raphe well developed. On each side of the raphe cells are arranged in three groups, which have been called nucleus basilaris, nucleus centralis, and nucleus lateralis. The nucleus centralis includes superior and inferior divisions. The author observes that this centre in the crocodile may be related to the vagus; but adds that it is perhaps more probable that the cell-column which extends from the anterior bundles of the spinal accessory to the anterior bundles of the vagus contains all the cells in which both the vagus and hypoglossal nerves originate, the reason for this doubt being that the roots of the hypoglossal nerve have not been traced. The origin, however, of the abducens nerve is evident in all the reptiles examined; it lies in the floor of the ventricle, and is well seen in section.

The cells connected with the auditory nerves show many variations in the different animals. In the frog the motor bundle of the trigeminal nerve is seen in cross sections, though it is more easily demonstrated in true reptiles, and is well shown in a section of the medulla oblongata of the alligator.

The cerebellum is represented by longitudinal vertical sections.

In the marine turtles it completely covers the fourth ventricle, extending back twice as far as in the alligator. In the frog it is vertical, while in the tailed Batrachians it is more or less blended with the optic lobes. In heloderma the cerebellum curves forward, but is not closely applied to the optic lobes, as in other lizards. Just in front of the cerebellum is the valvula cerebelli, which contains the decussating fibres of the fourth pair of nerves.

The optic lobes are admirably represented in fifteen plates, which display the microscopic anatomy of this region of the brain in a striking manner, demonstrating a greater diversity of structure than would have been anticipated. This region of the brain in Ophidians appears to be characterized by an absence of the linear arrangement of the cells of the cortical layer, such as is seen in other reptiles and in Batrachians. In Chelonians there is a remarkable ganglion formed of large cells in the roof of the optic lobe over the ventricle, and on each side of the central group are other layers of small cells. These layers of cells are regarded as the origin of the optic nerves. Beneath the optic lobes, in the peduncle, are the cells and fibres in which the oculo-motor nerve rises, though in the tailed Batrachians the origin of this nerve is not seen. In the axolotl some doubt appears to attach to the distinctness of the optic lobes. The optic thalami are seen one on each side of the V-shaped third ventricle, in front of the optic lobes. Beneath are the tuber cinereum and the cerebral hypophysis.

The cerebral hemispheres are examined in somewhat less detail; but the plates show a general correspondence of the parts in the several types. The corpus striatum is much larger in Lizards and Ophidians than in Batrachians; and in the alligator this organ is relatively larger than in the heloderma. In the box-turtle the corpus striatum has about the same development as in lizards.

Having thus treated in general terms of the chief parts of the central nervous system, the author prints an appendix on the average size of nuclei in the nerve-cells which are related to motor nerves, showing that the nuclei of the motor cells of the central nervous system have in the same individual a size which is proportional to the power in the related muscles. Similar relation of size in the nerve-cells is found in the spinal column to govern muscular development in the limbs; and the later plates are devoted to demonstrating the size of the nuclei in the cells connected with cranial nerves.

In a second series the author promises to examine the minute anatomy of the basal parts of the brain. The list of plates gives their amplification and subject; while on the plates themselves, besides description and number of the negative, the power of the object-glass and its maker are mentioned.

No words could do justice to the beauty of the plates or the value of the information they convey; and it is not too much to regard this work as opening a new era in research by substituting knowledge of facts of microscopical structure for their interpretation by the hand of artist or author; but we can scarcely hope to see many

books so beautifully illustrated. The author's method has the merit of inaugurating a comparison of the minute anatomy of the nervous system by enabling the reader to see the structures which he has discovered as he saw them; and hence the book will always be a valuable work of reference; and it will certainly induce others to hand on the torch of knowledge in a like excellent way.

*Memoirs of the Geological Survey of India. Palæontologia Indica, being Figures and Descriptions of the Organic Remains procured during the progress of the Geological Survey of India.* Published by order of his Excellency the Governor-General of India in Council. Series x. *Indian Tertiary and post-Tertiary Vertebrata.* Vol. II. Part 1. *Siwalik Rhinocerotida.* Part 2. *Supplement to Siwalik and Narbada Proboscidia*, with 11 plates: 1881. Part 3. *Siwalik and Narbada Equidæ*, with 5 plates: 1882. Part 4. *Siwalik Camelopardalidæ*, with 7 plates: 1883. Part 5. *Siwalik Selenodont Suina* &c., with 3 plates: 1883. By R. Lydekker, B.A., F.Z.S., Geological Survey of India. Calcutta: the Geological Survey Office. London: Trübner & Co.

The five parts published of the second volume of the Indian Tertiary Vertebrata are all by Mr. Lydekker, and devoted to Siwalik fossils. The volume will apparently include other parts, but already extends to 176 pages and 25 plates. There is no reason for the association of the parts in the way in which they are issued, and every part has a separate pagination as well as the pagination of the volume; the plates take the numbering for the volume only. On account of the wealth of material and interest of the types described, this work will always be important in palæontology; and we cannot help believing that its value is enhanced by the manner of dealing with the systematic part of the subject which the author has adopted, for the aims of science are certainly better served by making genera large and then showing the characters wherein the species differ from each other, than by adopting the too common method of subdividing genera till the evidences of their mutual dependence and of the evolution of species are obscured. If any one should observe that the author has not always adhered to so excellent a plan, it must be conceded that when the materials are scanty and the types such that their true nature cannot be worked out, then it becomes permissible to formulate whatever knowledge is available by a nomenclature which shall not prejudge affinities.

It is almost impossible to separate the fossil forms of rhinoceros from those which still live. Dr. Falconer detected the hornless rhinoceros, which he named *Acerotherium perimense*, and to this species Mr. Lydekker now refers the *Rhinoceros planidens* and *R. iravadicus*, which he has defined in the former volume: the teeth approach those of the rhinoceroses of Sumatra and Java. This is the only occurrence of *Acerotherium* in the Siwalik beds. The other